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Transportation Measures for the Improvement of Connecticut Air Quality

Prepared for Connecticut Department of Transportation

November, 1980

Cambridge Systematics, Inc.

TRANSPORTATION MEASURES FOR THE IMPROVEMENT OF CONNECTICUT AIR QUALITY

PHASE I - Draft Summary

Prepared for

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Preface

This report is a summary of a draft report documenting the results of a series of analyses of transportation measures relating to improvement of Connecticut air quality. Emphasis in this summary is on overall project findings, together with a brief description of the project itself. The full report contains more complete descriptions of the analysis results for individual transportation measures.

Preparation of both the analyses and the two reports has been financed in part through a grant from the US Environmental Protection Agency under Section 175 of the Clean Air Act and administered by the US Department of Transportation; and in part through a grant from the US Department of Transportation, Urban Mass Transportation Administration and administered by the Tri-State Regional Planning Commission. The opinions, findings and conclusions expressed in this publication, though, do not necessarily reflect the official views of the US Environmental Protection Agency; the US Department of Transportation, Urban Mass Transportation Administration; or the Tri-State Regional Planning Commission.

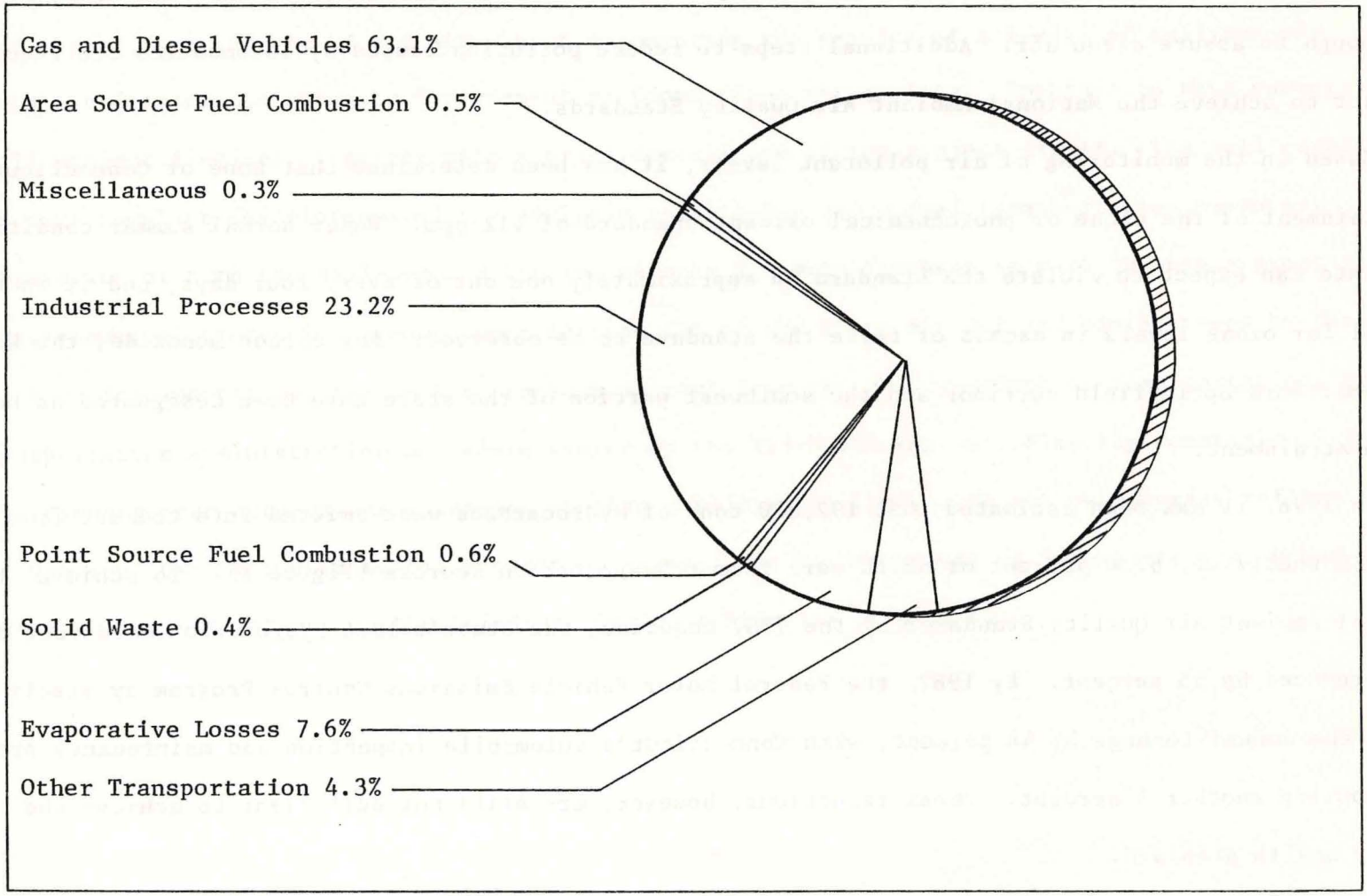
Air Quality in Connecticut

The state of Connecticut, like many other parts of the country, needs to reduce the amount of pollution in the air. Controls on factories and power plants and emissions controls on new cars help, but are not enough to assure clean air. Additional steps to reduce pollution caused by automobiles are required in order to achieve the National Ambient Air Quality Standards.

Based on the monitoring of air pollutant levels, it has been determined that none of Connecticut is in attainment of the ozone or photochemical oxidant standard of .12 ppm. Under normal summer conditions, the state can expect to violate the standard on approximately one out of every four days, and it is not unusual for ozone levels in excess of twice the standard to be observed. For carbon monoxide, the New Haven-Hartford-Springfield corridor and the southwest portion of the state have been designated as being in non-attainment.

In 1976, it has been estimated that 192,820 tons of hydrocarbons were emitted into the air from within Connecticut, 67.4 percent of which were from transportation sources (Figure 1). To achieve the National Ambient Air Quality Standards by the 1987 deadline, the state's 1976 hydrocarbon emissions need to be reduced by 55 percent. By 1987, the Federal Motor Vehicle Emissions Control Program by itself will reduce the annual tonnage by 44 percent, with Connecticut's automobile inspection and maintenance program contributing another 5 percent. These reductions, however, are still not sufficient to achieve the primary health standard.

FIGURE 1: 1976 Statewide Distribution of Hydrocarbon Emissions



Source: 1979 Connecticut State Implementation Plan

Available Transportation Actions

A desirable additional initiative involves the implementation of various transportation projects by both the State and its towns and cities. Projects programmed by the Connecticut Department of Transportation are to be directed towards achieving the goal of a 10 percent reduction in annual hydrocarbon emissions. An equivalent goal has been defined for the state's Regional Planning Agencies. In addition, the Department of Environmental Protection is investigating various additional motor vehicle controls, such as vapor recovery and light duty vehicle retrofit devices, which also are directed at achieving additional reductions in annual hydrocarbon emissions. The result of these efforts, together with the state's automobile inspection and maintenance program and the Federal Motor Vehicle Emissions Control Program, would be achievement of the necessary emissions reductions so that total 1987 hydrocarbon emissions would be less than 86,770 tons.

A wide variety of potential transportation measures that may contribute to the goal of reduced vehicular emissions could be implemented on a statewide basis within Connecticut (Table 1). Some of these, such as expansion of the existing bus transit fleet or introduction of additional rail passenger service, would require both reasonably large capital expenditures and a long lead time; other strategies are oriented to a much shorter time horizon and could be implemented both quickly and with a relatively small fiscal expenditure. Not all of the measures identified in Table 1, though, may be desirable or feasible. In addition, it is unlikely that any one single measure will be sufficient to achieve the target of a 10 percent reduction in the state's 1976 hydrocarbon emission levels; rather a multi-year program or package of actions will have to be implemented combining the benefits of several individual measures.

TABLE 1: Transportation Policy Areas and Measures Analyzed

Policy	Measures
1. Transit Service Improvements	Expansion of bus transit fleet by 50, 100 and 500 percent Expansion of off-peak service frequencies and service hours for existing fleets Introduction of additional public transportation schedule coordination (modal interface improvements)
2. Transit Fare	Reduction in transit fares Differential fare policy for peak and off-peak time periods Increased promotion and financial discount for pre-paid monthly transit pass programs
3. Buspooling and School Bus Use	Buspooling and financial assistance for starting costs Use of school buses during summer peak pollution periods.
4. Rail Passenger Improvements	Rail transit construction in lieu of major highways scheduled for construction after 1981
5. Regulation	Mandatory employee/vehicle ratios Elimination of drive-in windows Limitation on number of motor vehicle registrations Limitation on number of driver's licenses One-day-a-week driving ban Gasoline rationing Weekend ban on non-diesel gasoline sales
6. Pricing	Increased fuel taxes Increased auto ownership fees State gasoline tax rebate for vanpool journey to work Corporate exemption of state sales tax on vans purchased for vanpooling Corporate exemption of local property tax on vans purchased for vanpooling State subsidized vanpool liability insurance Carpool and vanpool cost subsidies Carpool parking subsidies Tax incentives for employer transportation programs
7. High Occupancy Vehicle Priority Lanes	I-95 East of New Haven I-95 West of New Haven I-91 New Haven I-91 South of Hartford I-91 North of Hartford I-84 East of Hartford I-84 West of Hartford Route 7, I-84 Danbury I-84 East and West of Waterbury Route 7 Norwalk Route 25 Bridgeport
8. Parking	Increase number of free commuter carpool parking lots, vanpool lots, express bus lots and rail station lots.

TABLE 1: (continued)

Policy		Measures
9.	Ridesharing	Carpooling: State employees carpooling program Carpool matching and consultation services to private employers Areawide carpool matching Deregulation of carpools Vanpooling: Vanpool assistance to private employers in urbanized areas Vanpool assistance to private employers in non-urbanized areas State employees vanpooling program--statewide Vanpool brokerage Deregulation of vanpools
10.	Bicycle Improvements	Facility Improvements Education Registration and Licensing Enforcement
11.	Goods Movement	Intercity Trucking: Increased size and weight limits Highway cost allocation Truck rate and service deregulation Truck emission standards Intercity Rail: Light density line abandonment Rail intermodal transportation Rail rate deregulation Urban Goods Movement: Consolidation of terminals and operations
12.	Marketing, Promotion and Public Information	Work trip commutation Transit and Ridesharing Air Quality and Energy
13.	Areawide Traffic Control System Improvements	Coordination of Signals Optimization of signal timing cycles, splits, and offsets Computerized Traffic Control
14.	Retail Sales Operations	Two-day-a-week retail store closing

Time Schedule

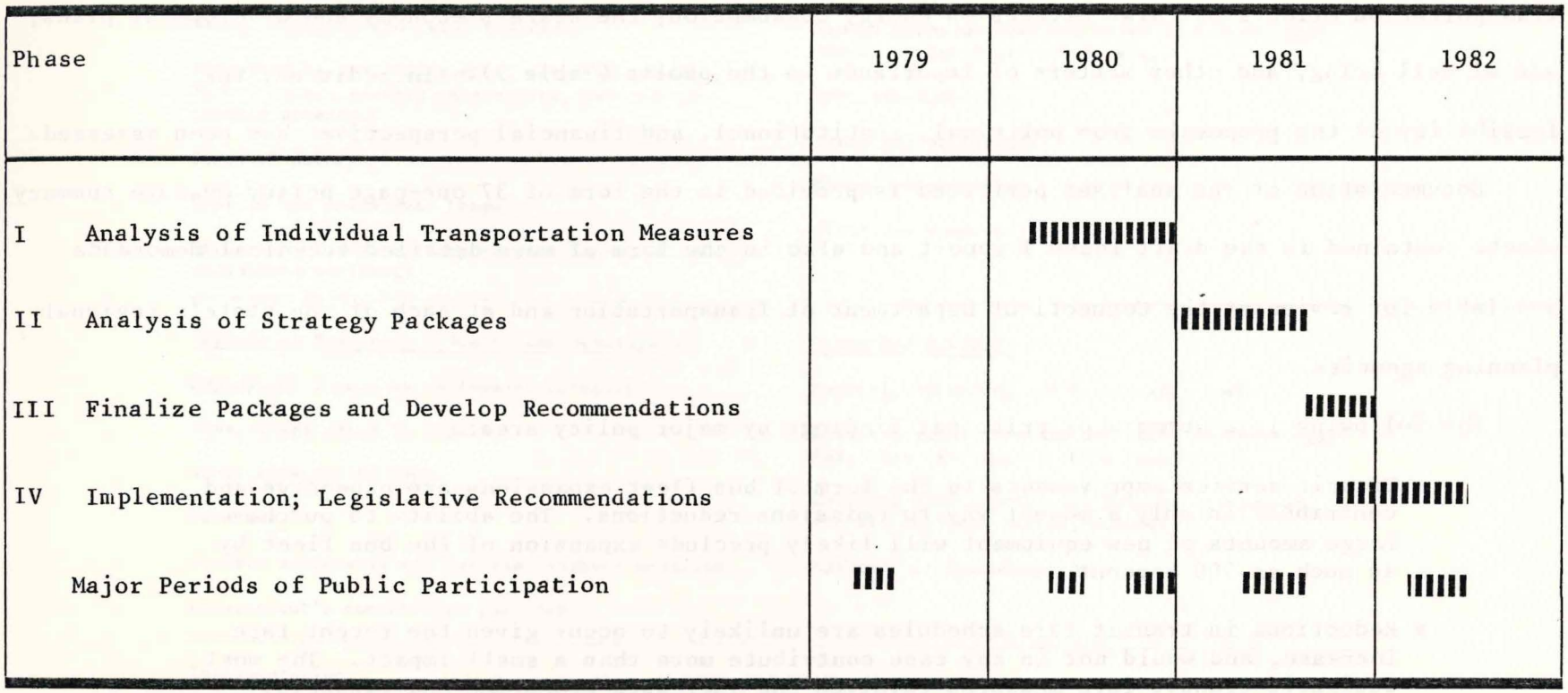
The analysis of transportation measures is being undertaken in a multi-phased work program (Figure 2). Those individual measures judged to be most promising during this initial phase will continue to be analyzed during the second phase and assembled into candidate program packages.

Phase I of the statewide analysis is scheduled to be completed during December, 1980 and the more detailed second phase analyses are anticipated to require the first eight months of 1981. At the completion of this second phase--during the fall of 1981--final recommendations will be developed and any remaining analyses will be completed. The July 1, 1982 submission of a new State Implementation Plan is to include evidence of commitments by state and local governments to implement and enforce the plan's provisions for selected transportation measures. Phase IV of the work program, occuring during early 1982, then constitutes an implementation phase in which any necessary supporting legislation will be developed and submitted for consideration to the 1982 session of the Connecticut State Legislature.

In parallel with the statewide analysis, each designated metropolitan regional planning agency is investigating corresponding strategies that can be implemented by either local or regional agencies. These regional analyses are proceeding with roughly the same schedule as the statewide study, with an initial screening phase being completed during the fall of 1980.

Emphasis throughout the work program is being given to working cooperatively with other state agencies, local officials, the regional planning agencies, public and private interest groups, employer and employee groups, the State Implementation Plan Revision Advisory Committee (SIPRAC) and the general public. Major periods of public participation also are indicated in Figure 2.

FIGURE 2: Time Schedule — Statewide Analysis of Transportation Air Quality Measures



Summary of Findings

Specific impacts evaluated during this first phase analysis include not only air quality and transportation effects but also effects on energy consumption, the state's economy and development plans, social well being, and other matters of importance to the public (Table 2). In addition, the feasibility of the proposals from political, institutional, and financial perspectives has been assessed.

Documentation of the analyses performed is provided in the form of 37 one-page policy measure summary sheets contained in the draft Phase I report and also in the form of more detailed technical memoranda available for review at the Connecticut Department of Transportation and at each of the state's regional planning agencies.

The following is a summary of principal findings by major policy area:

- Transit service improvements in the form of bus fleet expansions are expensive and contribute in only a modest way to emissions reductions. The ability to purchase large amounts of new equipment will likely preclude expansion of the bus fleet by as much as 500 percent.

- Reductions in transit fare schedules are unlikely to occur given the recent fare increase, and would not in any case contribute more than a small impact. The most desirable transit fare measures involves the increased promotion and financial discounts for pre-paid monthly transit passes.

- Buspooling and the alternative use of school buses both duplicate other means of transportation. In most cases, vanpooling is more cost-effective than buspooling, and normal transit vehicles are preferable to the use of school buses.

TABLE 2: Evaluation Criteria

Impacts on General Public

Urban, suburban and rural residents

Protected classes and special interest groups (poor, young, elderly, minorities, handicapped, transit dependent

Personal Safety

Cost to the individual taxpayer

Effects on travel by trip purpose (work, shopping, social/recreational)

Environmental Impacts

Travel behavior (vehicle miles of travel, mode choice, transit ridership, etc.)

NMHC emissions

Other air pollutants

Energy conservation

Other environmental factors

Impacts on Business, Industry and Development

Employment levels by employment category

Development rates by type

Goods movement by type

Land use

Current expressway and arterial highway programs

Connecticut's competitive position

Costs and Revenues

Capital, operating and maintenance costs

Loss (or gain) in state and local revenues (gas tax, tire tax, registration fees, etc.)

Existing and/or potential sources of revenue (local, regional, state, federal)

Indirect or secondary costs

Implementation

Steps required to implement

Agency(s) responsible for implementation

Schedule for implementation

Legal restrictions to implementation

New or modified legislation required

Expected public attitude and response

- The construction of new rail passenger service improvements cannot serve as a complete substitute for highway improvements. Further, rail transit is potentially feasible only in the Hartford area (in addition to New York City service), will contribute in only a very small way to statewide emissions reductions and will require a substantial cost.

- Regulatory measures can effectively contribute to emissions reductions largely because they directly or indirectly limit either the number of automobiles or the amount of travel that can take place. Effective implementation of most of these measures, however, will be extemely difficult, with some requiring either a regional or national implementation in order to be workable. Others are perceived primarily as energy contingency measures and would be difficult to implement on air quality grounds. Two regulatory measures judged to be more desirable than the others are the elimination of drive-in windows and a limitation on the number of driver's licenses.

- While Connecticut already has the nation's highest fuel taxes, further increases in the cost of owning and operating a private automobile would contribute in a meaningful way to emissions reductions. These strategies, however, could have other potentially serious adverse impacts. Other pricing mechanisms can serve to decrease the costs of carpooling and vanpooling or of using public transportation, and these are judged to be both desirable and feasible.

- High occupancy vehicle (HOV) priority lanes have the best implementation potential on I-91 North of Hartford, I-84/I-86 east of Hartford, I-84 west of Hartford, I-95 east of New Haven, I-95 west of New Haven and I-84 in Waterbury. On a statewide basis, though, the potential of HOV lanes is sufficiently restricted so that emission reductions are limited to about 0.18 percent.

- The state's commuter park-and-ride lot program has contributed to a reduction in NMHC emissions. Continuation and expansion of this program can increase the effectiveness of other state transportation air quality initiatives.

- Employer-based ridesharing programs, combined with the introduction of vanpool brokerage services, can contribute in a modest and cost-effective manner to improved statewide air quality. The majority of the benefits, however, are provided by vanpooling; carpooling, by itself, is judged to have only a limited potential.

- Bicycle improvements, though very popular with many interest groups, do not have the potential to make a large contribution to emissions reduction in Connecticut. Individual bike facility improvements and steps to improve storage and security, however, still may be desirable.

- Policies affecting the intra- and thru-state movement of goods via truck and rail have the potential to influence NMHC emissions. There are proposals to increase truck size and weight limits, and the recent national deregulation of the trucking and rail industry likely will lead to requests for corresponding state deregulation. Actions involving truck movements have more emissions reduction potential then rail related measures and can be combined into an overall legislative program.

- Public information, marketing and promotional programs, by themselves, have proven not to be highly effective in contributing to either emissions reductions or decreased fuel consumption. Such informational programs, however, are necessary to the smooth, effective introduction of almost all other transportation-air quality measures.

- Areawide coordinated traffic signal system improvements on the state's arterial highway system have the potential to produce 10 percent reductions in average travel times within the state's urbanized regions. The resulting emissions benefits are reduced, but not entirely offset, by induced automotive travel.

- A two-day-a-week retail closing would reverse the 1977 law allowing Sunday openings but would lead to a small emissions reduction. The vast majority of existing shopping travel would simply shift to alternate days, with also a probable geographic shift from suburban to downtown stores.

Analysis findings are categorized in Table 3 by potential emissions reduction and implementation "cost" where cost includes capital and continuing financial resources as well as the effort required to overcome other possible implementation barriers. A low emissions reduction is defined as being under a 1 percent decrease; modest reductions correspond to a 1-3 percent change; and a high reduction is likely to produce more than a 3 percent reduction. Table 4 is structured in a similar manner to Table 3, but tabulates the available measures by public and business acceptability. One conclusion which is apparent from examining these tables is that a 10 percent emissions reduction is possible to achieve; but only with a corresponding high implementation effort and cost, and one that is likely to generate a high level of political controversy. A second observation is that there are no measures which are both easy to implement and will yield potentially large emissions reductions. There are nonetheless several transportation measures that would yield meaningful emissions reductions and that could be implemented within a reasonable effort.

Transportation improvements seldom are implemented to accomplish only a single objective; rather a program of multiple goals and objectives generally controls the decision-making process. Especially with air quality, where the problem is neither visible nor well understood, it is important that an implementation program be based on the accomplishment of more than one high-priority state objective. For the kinds of measures under consideration, savings in fuel consumption can be achieved as well as decreases in vehicle emissions, and these in general will be of the same general order of magnitude. For

TABLE 3: Summary of Measures by Implementation Effort

	EMISSIONS REDUCTION POTENTIAL		
	LOW	MODEST	HIGH
HIGH IMPLEMENTATION EFFORT AND COST	Rail Passenger Transit Construction HOV Priority Lanes Two-Day-A-Week Retail Closing	Expansion of Bus Transit Fleet by 500%	Gasoline Rationing Weekday Driving Ban Mandatory Employee/Vehicle Ratios Significant Increase in Used Auto Ownership Fees
MODEST IMPLEMENTATION EFFORT AND COST	Expansion of Off-Peak Service Reduction in Transit Fares Buspooling Expansion of Bus Transit Fleet by 50, 100% Bicycle Improvements Increased Truck Size and Weight Limits Consolidation of Urban Goods Terminals and Operations Carpool and Vanpool Cost Subsidies Use of School Buses During Summer Peak Pollution Periods Rail Intermodal Service Elimination of Drive-in Windows Taxes to Encourage More Rapid Fleet Turnover Increase Highway Cost Allocation to Trucking Intrastate Truck Service and Rate Deregulation	Limitation on Motor Vehicle Registrations Weekend Ban on Gas Sales Limitation on Number of Driver's Licenses Sunday Driving Ban Truck Emissions Standards Increased Fuel Taxes	
LOW IMPLEMENTATION EFFORT AND COST	Modal Interface Information and Scheduling Improvements Transit Pass Programs Carpooling Park-and-Ride Lots Marketing, Promotion, and Public Information Programs Tax Rebates and Exemptions for Vanpooling Tax Incentives for Employer Transportation Programs	Vanpooling and Vanpool Brokerage Areawide Traffic Control System Improvements	

purposes of gaining public acceptance, these energy benefits may be of greater importance than the corresponding air quality improvements.

In Connecticut, as throughout New England, potential impacts on economic development will be critical in determining the reaction of both businesses and governmental units to various measures. Based upon an analysis of current population, employment, and economic trends within Connecticut, a number of the measures examined have the potential to contribute in a positive sense to the state's economic development policy (Table 5). While certain measures, generally of a regulatory nature, have the potential to hurt future economic growth, it would be incorrect to conclude that all transportation-air quality measures are incompatible with the state's economic objectives. Given a careful and sensitive design, it should be possible for reasonable further progress to be accomplished in achieving the National Ambient Air Quality Standards while simultaneously promoting economic development.

TABLE 4: Summary of Measures by Public and Business Acceptability

	EMISSIONS REDUCTION POTENTIAL		
	LOW	MODEST	HIGH
GENERALLY UNPOPULAR	Two-Day-A-Week Retail Closing	Limitation on Number of Motor Vehicle Registrations Sunday Driving Ban Weekend Ban of Gasoline Sales Truck Emissions Standards Increased Fuel Taxes	Mandatory Employee/Vehicle Ratios Weekday Driving Ban Gasoline Rationing Significant Increase in Used Auto Ownership Fees
ACCEPTABLE TO SOME	Reduction in Transit Fares Differential Fare Policy for Peak and Off-Peak Time Periods Elimination of Drive-in Windows Moderate Increase in Used Auto Ownership Fees Increased Truck Size and Weight Limits Increased Highway Cost Allocation to Trucks Truck Rate and Service Deregulation Rail Intermodal Transportation Consolidation of Urban Goods Terminals and Operations HOV Priority Lanes Use of School Buses During Summer Peak Pollution Periods	Limitation on Number of Drivers Licenses	
GENERALLY ACCEPTABLE	Expansion of Off-Peak Service Expansion of Bus Transit Fleet by 50, 100% Modal Interface Improvements Increased Promotion of Transit Pass Programs Buspooling and Financial Assistance for Starting Costs Tax Exemptions and Insurance Subsidization for Vanpools Carpool and Vanpool Cost Subsidies Tax Incentives for Employer Transportation Programs Park-and-Ride Lots Bicycle Improvements Prevention of Light-Density Rail Line Abandonment Intercity Rail Line Deregulation Marketing, Promotion, and Public Information Programs Rail Passenger Improvements Carpooling	Vanpooling and Vanpool Brokerage Traffic Signal System Improvements Expansion of Bus Transit Fleet by 500%	

TABLE 5: Summary of Measures by Potential Impact on Economic Development

	EMISSIONS REDUCTION POTENTIAL		
	LOW	MODEST	HIGH
NEGATIVE IMPACT ON ECONOMIC DEVELOPMENT	Increased Highway Cost Allocation to Trucks Two-Day-A-Week Retail Closing	Limitation on Number of Motor Vehicle Registrations Sunday Driving Ban Weekend Ban on Gasoline Sales Increased Fuel Taxes Truck Emissions Standards	Mandatory Employee/Vehicle Ratios Weekday Driving Ban Gasoline Rationing
NO SIGNIFICANT IMPACTS ON ECONOMIC DEVELOPMENT	Expansion of Bus Fleet by 50 or 100% Expansion of Off-Peak Transit Service Modal Interface Improvements Differential Fare Policy for Peak and Off-Peak Reduction in Transit Fares Use of School Buses During Summer Peak Pollution Periods Elimination of Drive-in Windows Bicycle Improvements Intercity Rail Rate Deregulation Moderate Increase in Used Auto Ownership Fees	Limitation of Number of Drivers Licenses Traffic Signal System Improvements	Significant Increase in Used Auto Ownership Fees
POSITIVE IMPACTS ON ECONOMIC DEVELOPMENT	HOV Priority Lanes Rail Passenger Improvements Marketing, Promotion, and Public Information Programs Increased Promotion for Transit Pass Programs Buspooling and Financial Assistance for Starting Costs Tax Exemptions and Insurance Subsidization for Vanpools Carpool and Vanpool Cost Subsidies Tax Incentives for Employer Transportation Programs Park-and-Ride Lots Increased Truck Size and Weight Limits Truck Rate and Service Deregulation Prevention of Light-Density Rail Line Abandonment Rail Intermodal Transportation Consolidation of Urban Goods Terminals and Operations Carpooling	Expansion of Bus Fleet by 500% Vanpooling and Vanpool Brokerage	

Next Steps

During November and December, 1980, the results of the first phase technical studies are being reviewed through a series of meetings and workshops with state and local agencies and interest groups, as well as the general public. Based on the results of these inputs, a specific set of recommended Phase II analyses will be developed. While the general purpose of this second phase is to develop greater detail than has been possible during Phase I, four specific kinds of activities can be undertaken:

- more detailed design and analysis of individual measures; for example, determining the maximum desirable limit for expanding the state's park-and-ride program.
- more detailed assessments of particular impacts; for example, examining potential impacts on business, industry, and development.
- prioritization of proposed actions of a given type into a multi-year implementation program; for example, development of a prioritized list of candidate bicycle improvement projects.
- analysis of alternative packages; for example, combining several employer-based ridesharing and transit improvement activities.

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